

CHEST X-RAYS

General Radiographic Findings

00:00:08

- **Air bronchograms** are seen when there are alveolar opacities, but the air within the bronchi is still visible. This can indicate pneumonia or consolidation, ARDS, pulmonary edema, or bronchoalveolar carcinoma.



Ill Defined Fluffy borders
No tracheal shift

- A **meniscus sign** with obliteration of the costophrenic angle suggests pleural effusion.
- A **lateral decubitus view** is the best x-ray view to detect pleural effusion.
- **CT scans** are the investigation of choice for evaluating effusions, pneumothorax, pneumomediastinum, pneumoperitoneum and pneumopericardium.

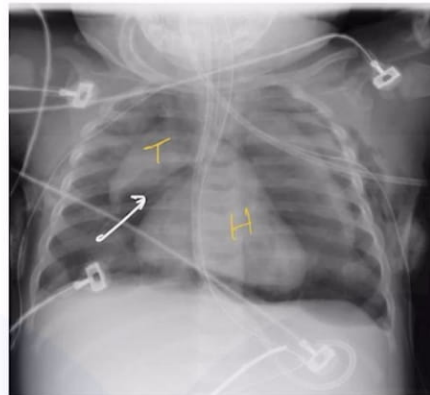
Specific Conditions

- **Pneumonia/Consolidation** shows ill-defined fluffy opacities, and may also present with air bronchograms.
- **Pleural effusion** may display a meniscus sign, obliteration of the costophrenic angle, and a shift of the trachea and mediastinum to the opposite side in a large effusion. It takes **150-200** ml of fluid to be seen on a standard chest x-ray but only **10-15** ml on a lateral decubitus view. (best Xray view)



Obliteration Of CP angle
Meniscus sign
Ellis Curve

- **Pneumomediastinum** may show a **spinnaker sign**/ **Angel wing sign** (thymus lifted from the heart), a **continuous diaphragm sign** (air under the heart), and air around the trachea, bronchi, and pulmonary artery. Esophageal perforation may produce a **Naclerio's "V" sign** where air lies on the lateral aspect of the descending aorta.

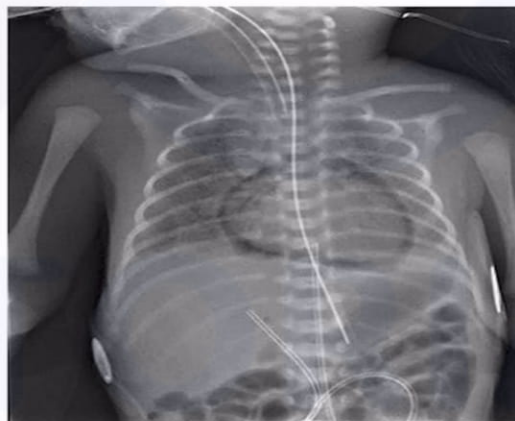


Spinnaker sign
Continuous diaphragm sign

Pneumopericardium

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- **Pneumopericardium** presents with air around the heart, limited by the pericardium, and may also show a continuous diaphragm sign.



Pneumoperitoneum

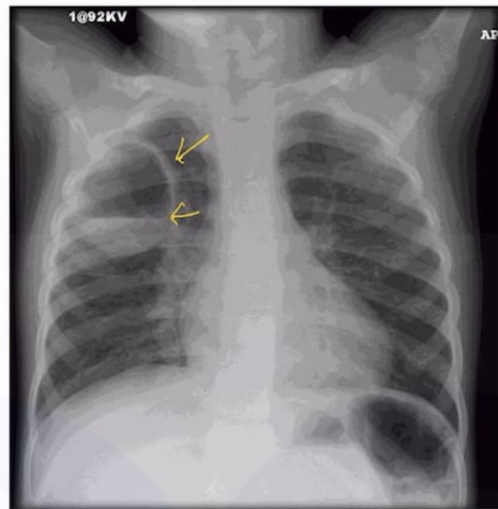
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- **Pneumoperitoneum** shows air under the diaphragm.



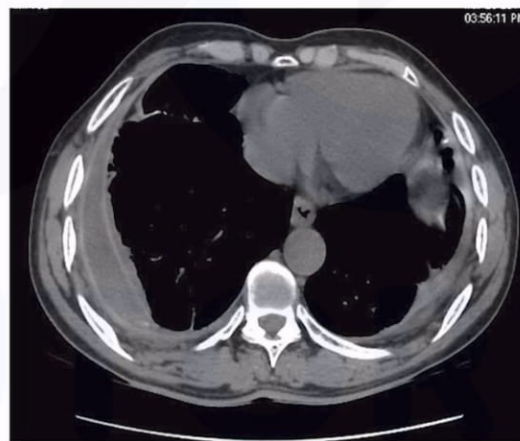
Air Under Right Hemidiaphragm

- **Lung abscess** is characterised by a thick-walled cavity with a horizontal air-fluid level.



Thick walled cavity
with horizontal air fluid level

- **Empyema** is an infected pleural collection with adjacent pleural thickening.



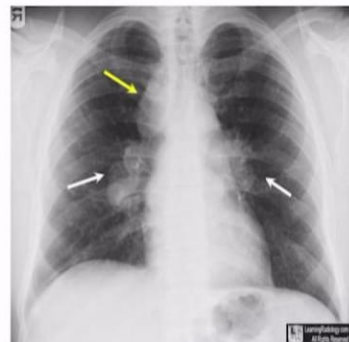
Split Pleura Sign

- **Hydropneumothorax** shows a horizontal air-fluid level in the pleural space.
- **Haemothorax** is the opacification of the thorax following trauma.



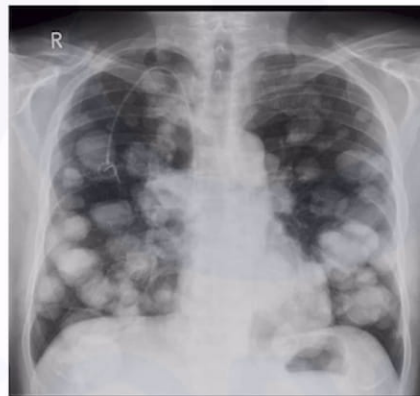
• Hydropneumothorax- Horizontal
Air Fluid levels

- **Sarcoidosis** presents with bilateral hilar lymphadenopathy, often with a **1-2-3** or "garland" sign. CT scans may show perilymphatic nodules, called a "galaxy sign". Gallium scans may show a lambda sign in the thorax and a "panda" sign in the face.



- 1,2,3 sign/Garland sign
- B/I Hilar Lymphnodes and Rt Paratracheal LN

- **Pulmonary Metastasis** can appear as multiple "cannonball" opacities, and are commonly seen with renal cell carcinoma and choriocarcinoma.

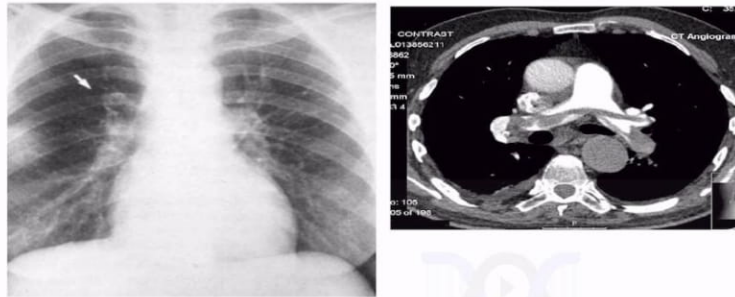


- **Pulmonary oedema** can be:
 - **Cardiogenic:** Characterised by bilateral, confluent opacities in a batwing configuration with increased pulmonary capillary wedge pressure more than **18** mmHg, increased heart size, central opacities, Kerley B lines, and pleural effusions.
 - **Non-cardiogenic:** Presents with normal heart size, peripheral opacities, and pulmonary capillary wedge pressure less than **18** mmHg.



- Bat Wing Opacities-Pulmonary Edema

- **Pulmonary Thromboembolism (PTE)** may show a **Westermarck sign** (pulmonary oligemia), and **Hampton's hump** (peripheral wedge-shaped infarct). CT angiography is the investigation of choice, and may show a "saddle embolus" at the pulmonary artery bifurcation. Echocardiography may show McConnell's sign (right ventricular hypokinesis).



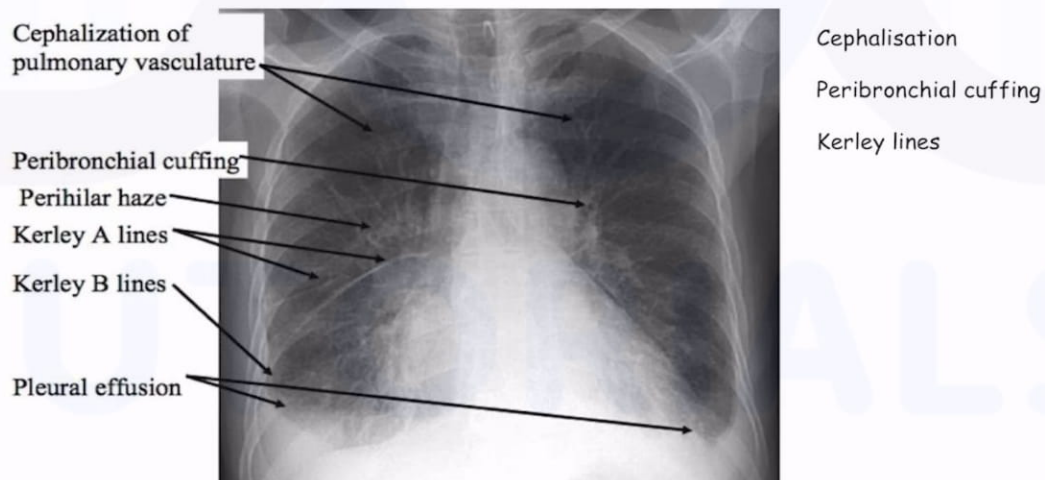
Westermarck Sign

Hampton Hump

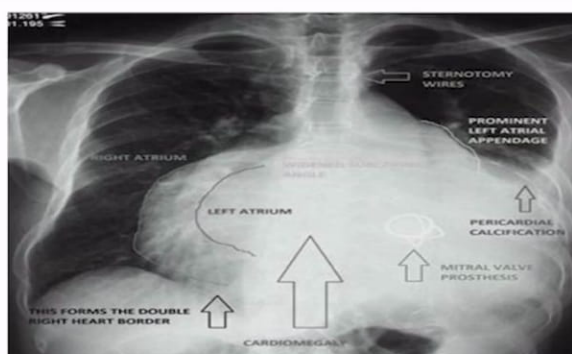
Congestive Heart Failure

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- **Congestive heart failure** is categorised by:
 - **Vascular Phase:** Prominence of upper lobe vessels (cephalization, stag antler, reverse mustache, or hands-up sign).
 - **Interstitial Phase:** Peribronchial cuffing, Kerley B lines, and interstitial septal thickening.
 - **Alveolar Phase:** Pulmonary capillary pressure is more than **25 mmHg**.

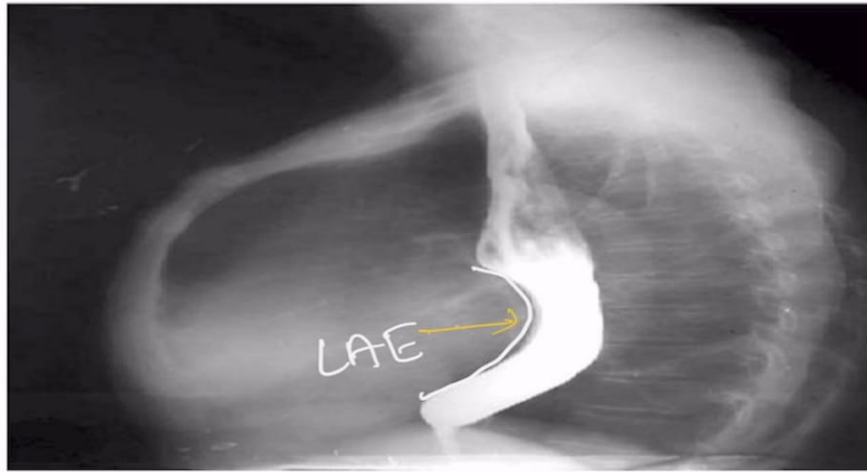


- **Left Atrial Enlargement/Mitral Stenosis** presents with a double right heart border, elevation of the left main bronchus, and splaying of the carina, often referred to as the "walking man sign". A barium swallow may show anterior indentation of the oesophagus.



Double Right Heart Border

Walking man sign
 Straightening of left Heart Border
 Splaying of Carina



Anterior indentation of Esophagus

- Epiglottitis shows a thumb sign (thickened epiglottis) on a lateral cervical radiograph.
- Croup shows a steeple sign (narrowing of the trachea) on a lateral cervical radiograph.



Thumb Sign-
Acute Epiglottitis

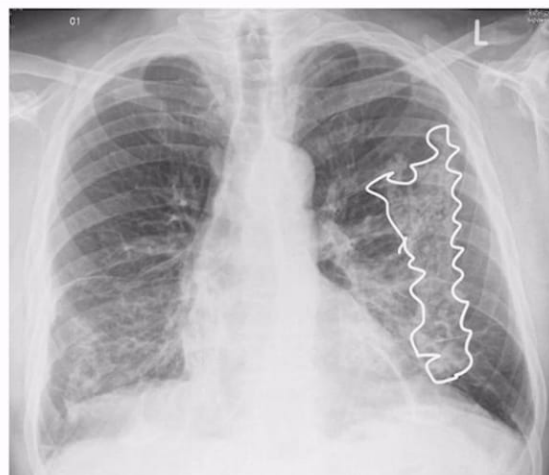


Steeple Sign-ALTB
Parainfluenza

Asbestosis

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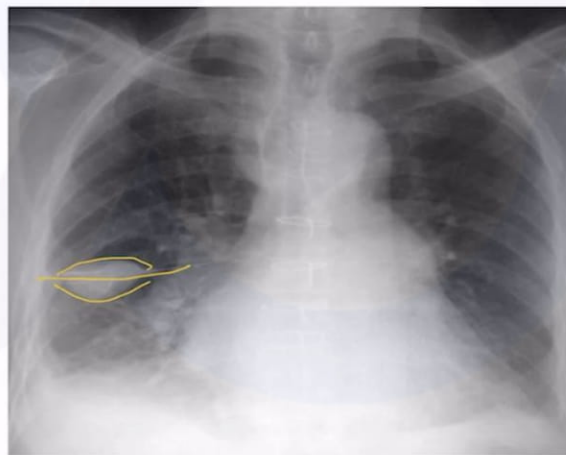
- **Asbestosis** may present with pleural calcifications (holly leaf sign), pleural thickening, and rounded atelectasis with a "comet tail" sign on CT. Mcc cancer bronchogenic ca and most specific cancer is mesothelioma



- **Pulmonary hamartoma** is a solitary, lobulated lesion with a popcorn-like appearance.



- **Interlobar effusion / phantom tumor** is a fluid collection along the visceral lines, also called a phantom tumour.



Interlobar effusion/Phantom Tumor

- **ARDS/Hyaline membrane disease** presents with a white-out lung with decreased lung volume, and ground-glass haziness, with dense consolidation posteriorly on CT.

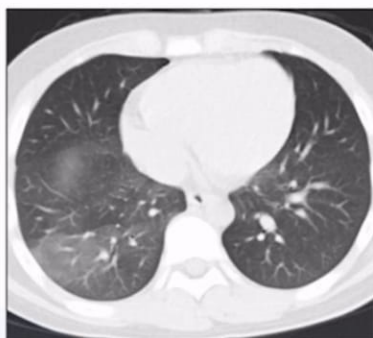


White Out Lung
Anteroposterior Gradient of CT -Chest

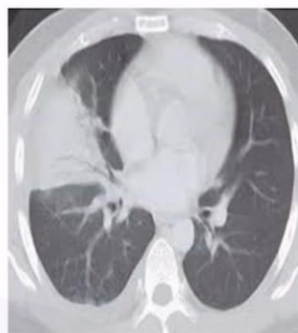
COVID-19

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- **COVID-19** initially shows ground-glass opacities. Typical findings include bilateral, peripheral, multifocal ground-glass opacities progressing to crazy paving, multifocal consolidations, and a reverse halo sign, and is categorised as CORADS 5.



Ground Glass Opacities-

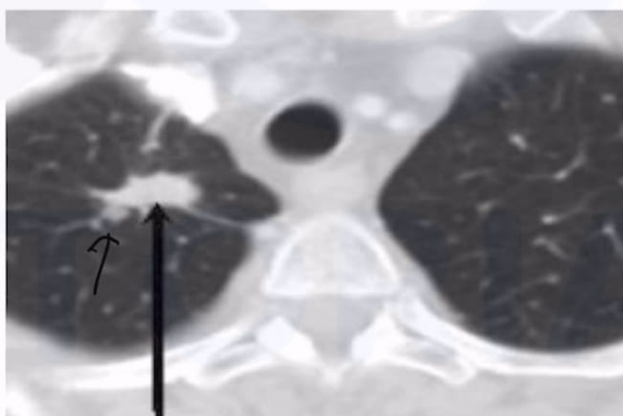


Consolidation-Airbronchogram

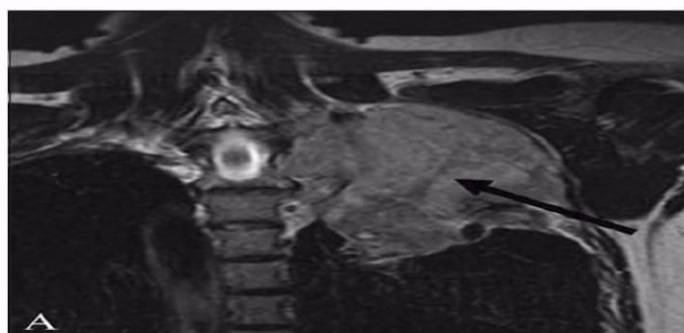
Lung Cancer

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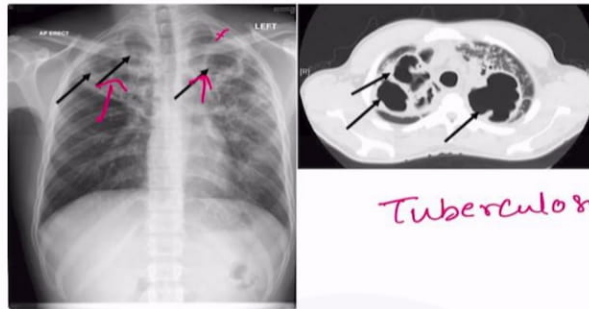
- **Lung cancer** can be an irregular, speculated lesion, but a well-defined lesion less than 3cm is a solitary pulmonary nodule. Previous images should be checked, and CT guided biopsy is confirmatory. PET scans are used for lesions >8mm, and low dose non-contrast CT for lesions <8mm, for follow up.



- A **Pancoast tumour** is an apical mass invading the brachial plexus and subclavian vessels, and MRI is the preferred investigation.

Pancoast Tumor-Apical Lung Ca
Ioc-MRI

- **Pulmonary fibrosis** shows bibasal reticulation and a honeycomb appearance.
- **Tuberculosis** presents with:
 - Heterogeneous opacities and cavitation in the bilateral upper lobes.
 - Tree-in-bud opacities due to endobronchial spread of Tb and also in bronchiolitis.



Heterogenous opacities
in bilateral upper lobes, cavitations

- Miliary TB: Small, millet-seed-like opacities bilaterally. can also appear in histoplasmosis, sarcoidosis, pulmonary hemosiderosis, mitral stenosis



Miliary Tuberculosis

Interstitial Lung Disease

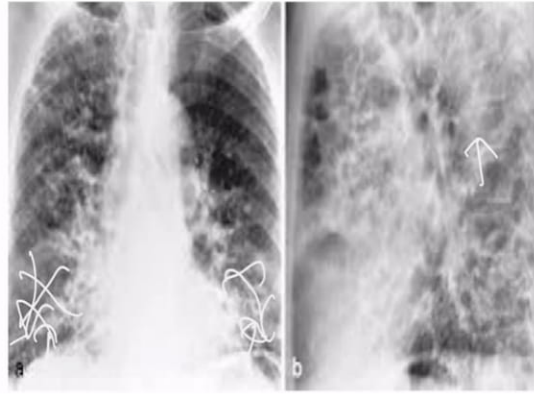
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- **Interstitial lung disease** is investigated with HRCT.
 - **Non-specific Interstitial Pneumonia (NSIP)** presents with ground glass opacities and subpleural sparing.
 - **Usual Interstitial Pneumonia (UIP)** shows subpleural honeycomb with traction bronchiectasis and diffuse reticulation.



Subpleural Honey combing
Traction Bronchiectasis
Reticulations
Usual Interstitial Pneumonia

- **Pulmonary Fibrosis** presents with bibasal reticulation with honeycomb changes in the entire lung.



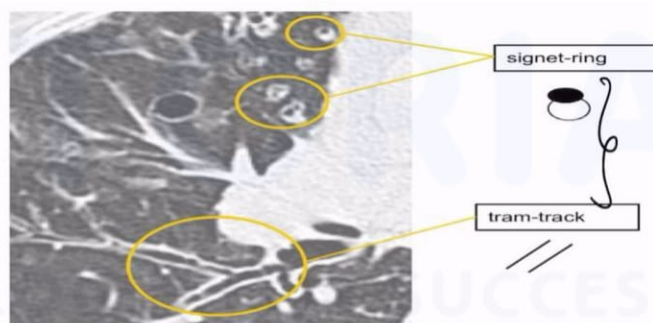
Bronchiectasis

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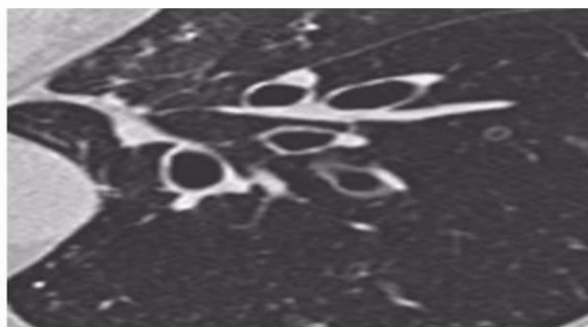
- **Bronchiectasis** presents with dilated bronchi, often with a signet ring or tram track appearance on mc in lower lobe CT. Middle lobe bronchiectasis is suggestive of MAC infections. Upper lobe bronchiectasis is seen with cystic fibrosis



Bunch of grapes appearance-bronchiectasis



Tram Track Appearance



Signet Ring Appearance → branch

Pulmonary Alveolar Proteinosis

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- **Pulmonary Alveolar Proteinosis** shows a crazy paving appearance on CT due to excess surfactant not cleared by macrophages. Also in COVID 19



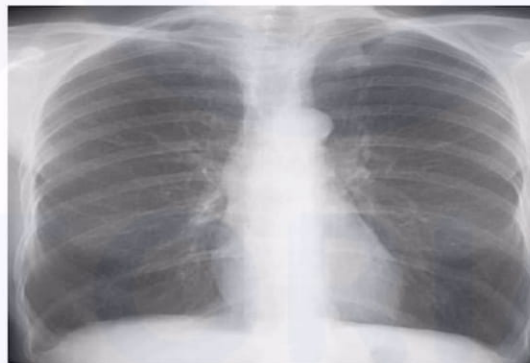
Crazy Pavement
Appearance on CT chest

- **Hypersensitivity Pneumonitis** shows mosaic attenuation with ground glass areas, hyperinflated areas, and normal areas on CT, commonly due to exposure to organic dust.

Emphysema/COPD

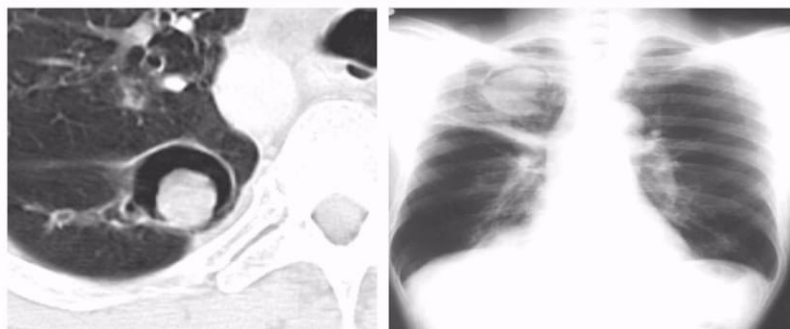
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- **Emphysema/COPD** presents with hyperinflated lungs, >10 posterior ribs visible on chest x ray with widened intercostal spaces, flattened diaphragms, and a longitudinally placed heart. The retrosternal space is increased in emphysema unless there is right ventricular hypertrophy.



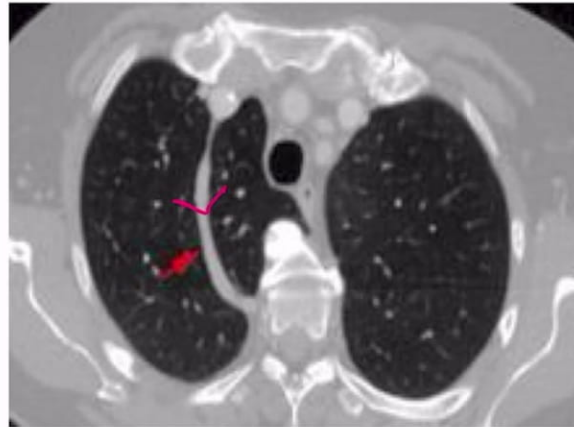
Widening Of Intercostal Space
Flattening of Dome of Diaphragm
Hyperinflated Lung Fields

- **Aspergilloma** is a fungus ball within an old TB cavity, and shows a meniscus sign that changes position (Monod sign).



MONOD SIGN -

- **Azygos fissure** is an arching fissure at the apex of the right lung.

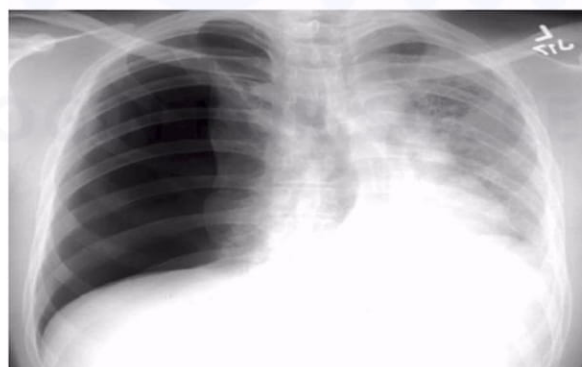


Azygos fissure

Pneumothorax

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- **Pneumothorax** presents with absent bronchovascular markings, a visible visceral pleural line, and a deep sulcus sign compared to the normal side. IOC is CT SCAN

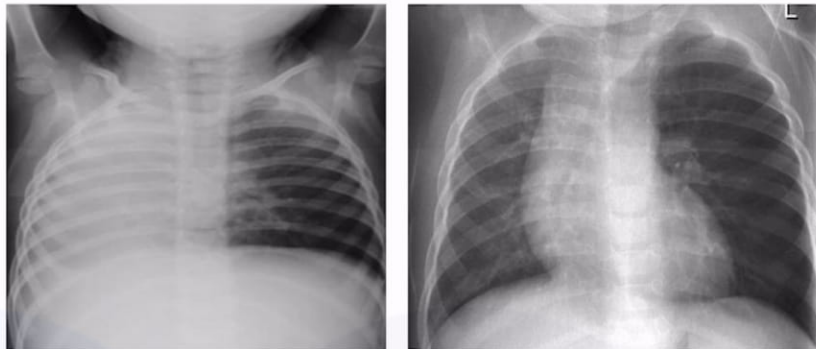


Absent Bronchovascular Markings
Visceral Pleural Line
Deep Sulcus sign

- **Tension Pneumothorax** is a pneumothorax with mediastinal shift, circulatory collapse, and hypotension and requires urgent needle decompression followed by intercostal drain insertion.

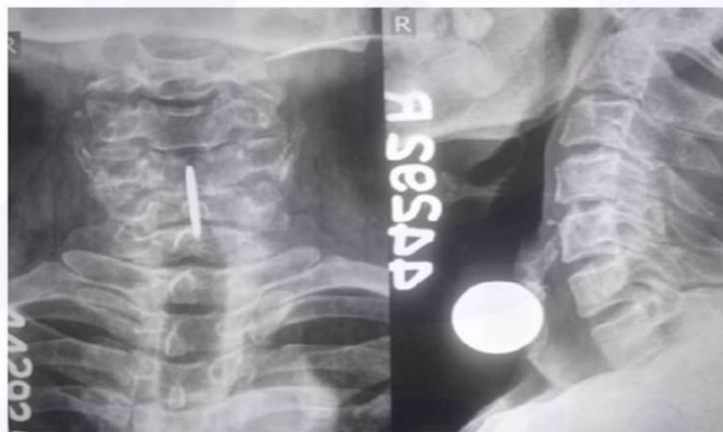
- **Foreign Body** can show an opaque hemithorax (complete obstruction) or a lucent hemithorax with air trapping IN EXPIRATORY VIEW

2 Year old child with sudden onset of respiratory distress
with Opaque Hemithorax/ Lucent Hemithorax



- A coin in the trachea will be seen in the sagittal plane, removed by rigid bronchoscopy.

Coin in Trachea

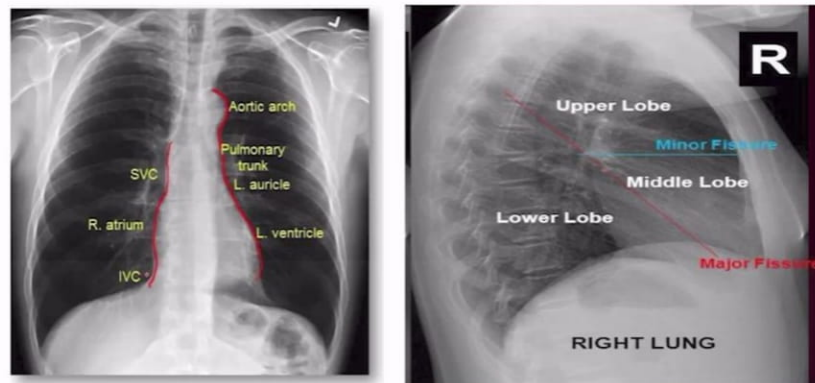


- A coin in the oesophagus is in the coronal plane.
 - Button batteries are highly alkaline, show a double ring or a step off, and should be removed urgently via esophagoscopy.



- Heart borders

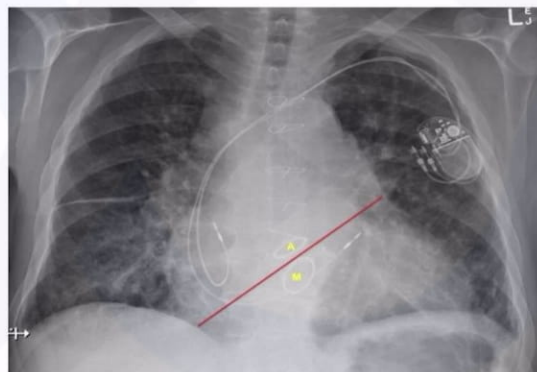
Heart Borders



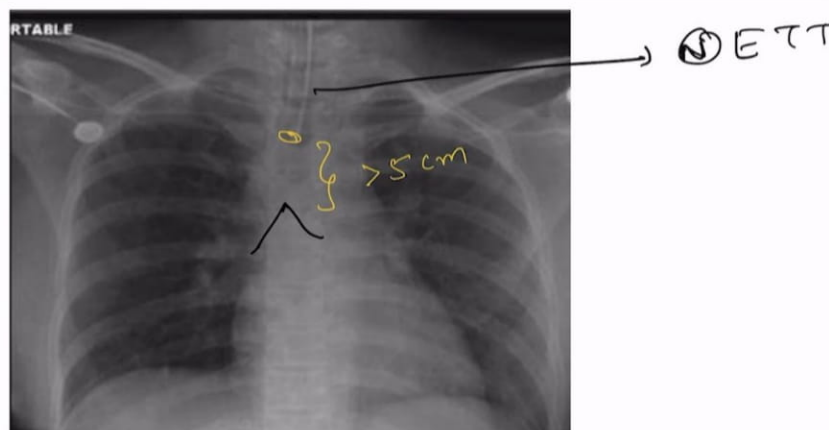
Cardiac Pacemakers

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- Cardiac pacemakers have thin electrodes located in the right atrium and right ventricle.

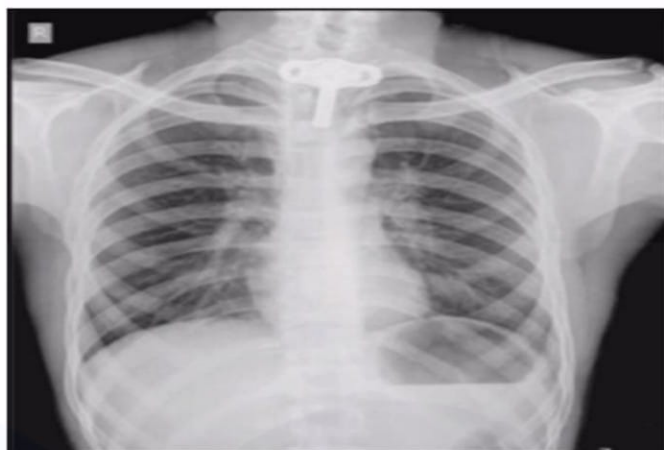
Cardiac Pacemaker and
Prosthetic Aortic and Mitral Valve

- Prosthetic heart valves:** Aortic valves are located above an imaginary line drawn from the left hilum to the right cardiophrenic angle. Mitral valves are below this line. Tricuspid valves are inferior and to the right, and pulmonary valves are superior and to the left.
- Endotracheal tubes** should have the tip more than 5 cm from the carina. Faulty insertion may result in the tube entering one of the main bronchi.



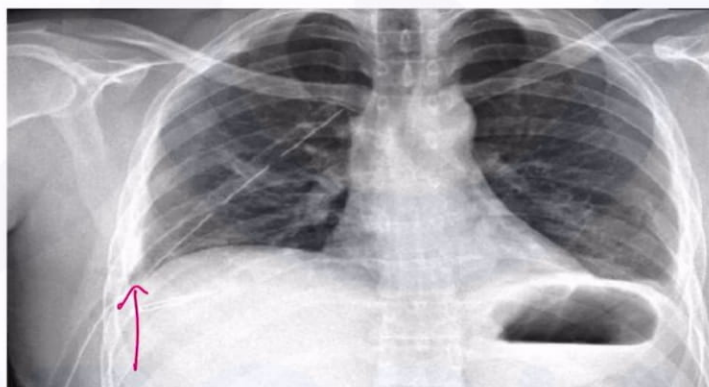
Endotracheal tube

- **Tracheostomy tubes** are also mentioned for comparison with endotracheal tubes



Tracheostomy tube

- **Intercostal chest tube**



Intercostal Chest tube

LOGIN FOR SUCCESS

Mind Map

Chest X-rays

General Radiographic Findings

- Air bronchograms Pneumonia/Consolidation ARDS
- meniscus sign with obliterated CP angle -> Pleural effusion
- > L. Decubitus View Best for pleural effusion

Pulmonary Dedema

- Cardiogenic - Batwing
- Non Cardiogenic PCHIP < 18 Peripheral opacities

CHF

- vascular phase stag antla sign
- Interstitial Phase -> Kerley B Lines interstitial septal thickening
- Alveolar Phase - PCWP > 25 mmhg

Interstitial Lung Disease

- NISIP Ground glass opacities
- UIP - Honey comb traction bronchiectasis